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Science and Technology for Tomorrow's Air and Space Force

Success Story

SCIENTIST EARNS AIR FORCE BASIC RESEARCH AWARD "HONORABLE MENTION" FOR CONTRIBUTIONS IN CONDUCTIVE POLYMER CLADDING RESEARCH



Dr. James G. Grote's conductive polymer cladding research, adopted by all nonlinear optic (NLO) polymer device fabricators including industry, universities, and Department of Defense laboratories, rendered these devices viable for both ground and space-based, high-performance Air Force systems, potentially including polymer-based lasers. His research enables the development of not only new devices with world-record operating performance, but also of state-of-the-art NLO polymer materials with diverse applications for both the military and the private sector. Dr. Grote's research could also lead to significant reductions in associated fabrication and manufacturing costs.



Air Force Research Laboratory
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Accomplishment

Dr. Grote, a senior research scientist at the Materials and Manufacturing Directorate received an Air Force Basic Research Award “Honorable Mention” for outstanding contributions in conductive polymer cladding. This award recognizes Dr. Grote, of the directorate’s Survivability and Sensor Materials Division, for pioneering work in the theory and materials processing of NLO polymer-based electro-optic (EO) devices, which can support current and future systems.

The award also recognizes Dr. Grote for advancing the fundamental understanding, design, development, assessment, and performance of electronics. His research enables the Air Force to meet its high bandwidth, low operating voltage and performance goals in a relatively short time and advances the potential for NLO polymer-based EO devices becoming the industry standard.

Background

Dr. Grote received the coveted Air Force Basic Research Award “Honorable Mention” for several outstanding accomplishments in the field of opto-electronics and, in particular, his contributions in optical interconnects for multi-chip module integration. His research focuses on high-performance semiconductor, polymer, and ferro-electric-based opto-electronic interconnects and devices as well as optical lithography for interconnect and device fabrication.

Dr. Grote’s team investigated the shortfall in actual performance achieved, relative to theoretical performance, for NLO polymer-based EO devices for Air Force systems. NLO polymer-based devices offer numerous attractive advantages over EO devices based on alternative materials.

NLO polymers have low dielectric constants and demonstrate a tolerance to high levels of irradiation for potential use in space-based applications. Also, Dr. Grote and his research team synthesized the NLO polymers with tailorable, high non-linearity to demonstrate the first sub-1 volt operating voltage for an NLO polymer EO device. It was, in fact, the lowest operating voltage reported for any EO device. Potential sub-1 volt device operation is required for integration into Air Force systems and is also useful for commercial applications.

Dr. Grote holds a doctorate degree in electrical engineering from the University of Dayton. He is a former Avionics Directorate “Engineer and Scientist of the Year” and an adjunct professor in the Electrical and Computer Engineering Department at the University of Dayton as well as an advisor for graduate students there and at the University of Cincinnati. He is a 2002 recipient of the directorate’s prestigious Charles J. Cleary Award for Scientific Achievement.

Additional information

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